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Serpulidae (Annelida, Polychaeta) Collected around Chichi-jima (Ogasawara Islands)

By

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今島 実*: 小笠原諸島の父島周辺海域から得られたカンザシゴカイ類(多毛類)

A benthic survey was carried out around Chichi-jima, in June, 1976, by the National Science Museum, Tokyo, for the Natural History Research Project of the Japanese Islands.

The Ogasawara Islands (Fig. 1) are situated more than 1000 km off Tokyo in the sub-tropical zone. This area is influenced by several warm return currents originating from the Kuroshio and North-equatorial currents; the average water temperature is 23.5°C (19.9°C–28.2°C), transparency is 26.5 m and chlorinity is 19.22 ‰. These oceanic islands far from the main land have a characteristic marine fauna due to their isolated geographical position.

Although many polychaetes have been obtained in this survey, this report deals with species of Serpulidae only. Up till now only three serpulid species in the genus *Hydroides* had been recorded from the area (IMAJIMA, 1976b).

The calcareous tubes of Serpulidae are attached to rocks, corals, shells, and other hard substrates. The specimens were collected by hand in the intertidal zone and by dredging from depths ranging from 36 to 110 m.

In the present study 18 species in 9 genera are recognized. The material includes two new species of the genus *Metavermilia* and one new subspecies of *Protula*. Three species, recorded previously from Australia, viz.: *Serpula watsoni, Pomatostegus stellatus, Spirobranchus* cf. *polytrema,* one species reported from the Red Sea, viz.: *Crucigera tricornis,* and very remarkably the mediterranean-tropical atlantic species *Vermiliopsis labiata* are new to the Japanese fauna.

The author wishes to express his thanks to Dr. H. A. TEN HOVE of the Laboratory for Zoological Ecology and Taxonomy, Utrecht, the Netherlands for critically reading the manuscript and for valuable suggestions with regard to the taxonomic problems.

The bulk of the collections, including type-specimens, has been deposited in the National Science Museum, Tokyo; a small part is in the collection of TEN HOVE, Utrecht, nrs tHU 266–269.

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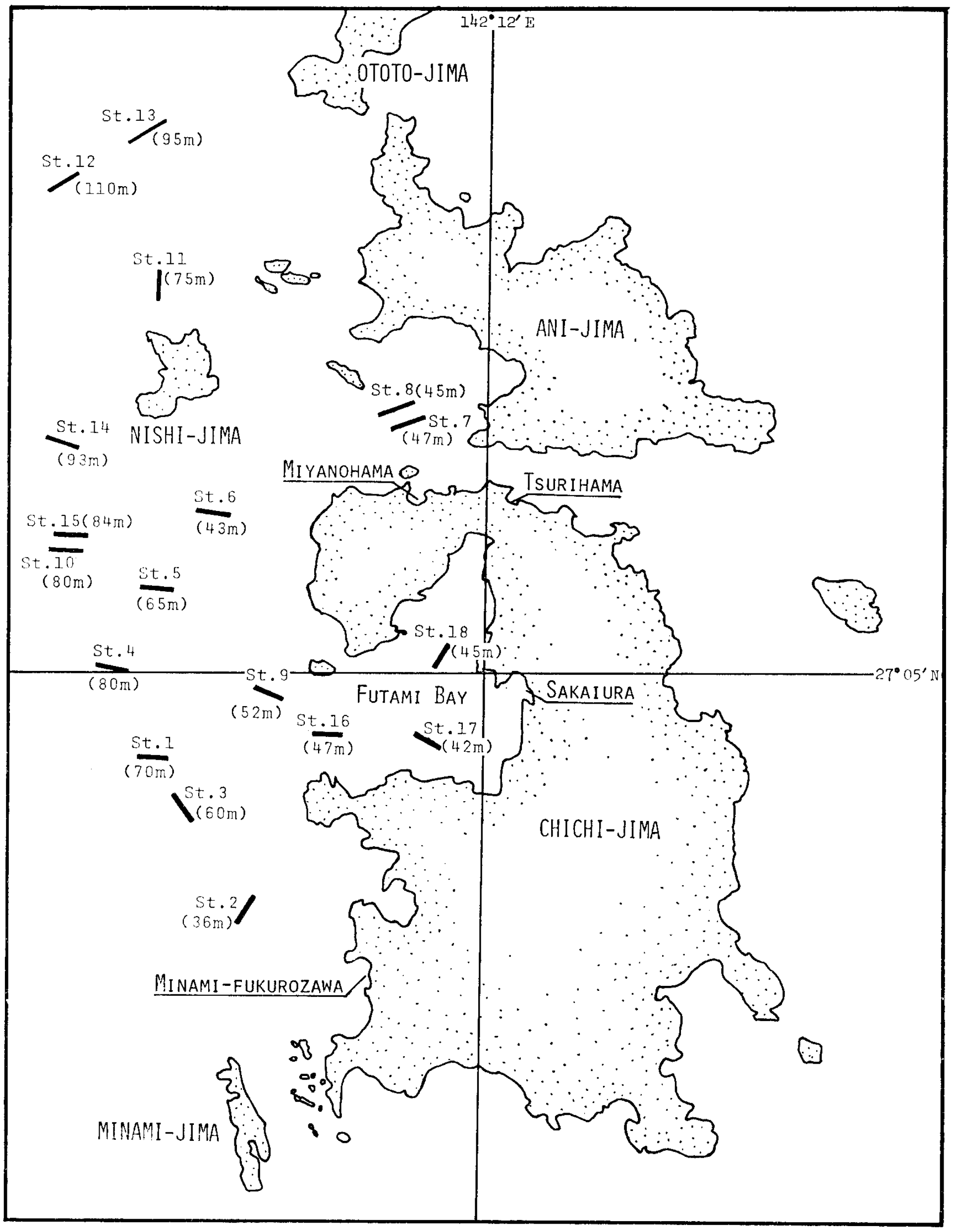


Fig. 1. Map of Chichi-jima and Ani-jima, Ogasawara Islands, showing the location and depth of the stations.

List of species represented:

Serpula watsoni WILLEY, 1905
Serpula vermicularis LINNAEUS, 1767
Crucigera tricornis GRAVIER, 1906
Hydroides fusca IMAJIMA, 1976
Hydroides exaltata (MARENZELLER, 1884)
Hydroides elegans (HASWELL, 1883)
Hydroides longispinosa IMAJIMA, 1976
Vermiliopsis infundibulum/glandigera-group
Vermiliopsis labiata (COSTA, 1861)
Metavermilia acanthophora (AUGENER, 1914)
Metavermilia spicata sp. nov.
Metavermilia inflata sp. nov.
Pomatoleios kraussii (BAIRD, 1865)
Pomatostegus stellatus (ABILDGAARD, 1789)
Spirobranchus polytrema (PHILIPPI, 1844)
Spirobranchus latiscapus (MARENZELLER, 1884)
Spirobranchus giganteus corniculatus (GRUBE, 1862)
Protula tubularia caeca subsp. nov.

Genus **Serpula** LINNAEUS, 1758

Serpula watsoni WILLEY, 1905

(Fig. 2)

Serpula watsoni WILLEY, 1905, p. 317, pl. 7, fig. 187, pl. 8, fig. 6; STRAUGHAN, 1967a, pp. 207–208, fig. 3b.

MATERIAL EXAMINED. Tsurihama, underside of corals on reef (8 specimens).

DESCRIPTION. The largest specimen measures 24 mm in length, including branchiae, and 1.8 mm in width in the thorax; it consists of 140 segments.

The branchiae have 22–23 gill-radioles on either side; the basal portion of gill-radioles

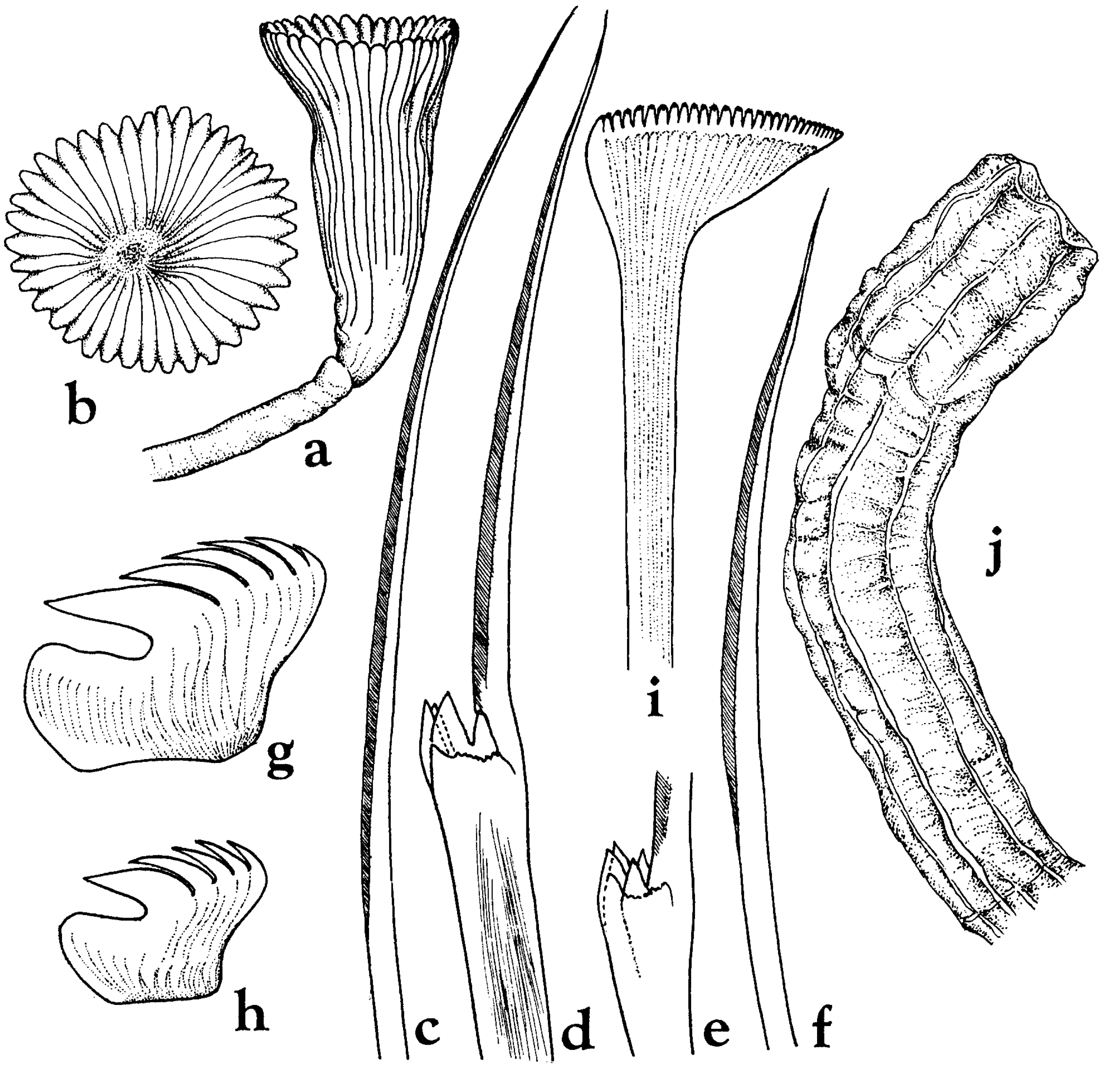


Fig. 2. *Serpula watsoni* WILLEY. a, Operculum, in lateral view, ×15; b, Operculum of different specimen, in frontal view, ×20; c, Collar seta, ×230; d, e, Collar setae, ×230; f, Thoracic seta, ×230; g, Thoracic uncinus, ×850; h, Abdominal uncinus, ×850; i, Abdominal seta, ×850; j, Tube, ×5.

is connected by a web-like branchial membrane. The peduncle is cylindrical and arises from the left branchial lobe; a rudimentary operculum is situated at the opposite side. The collar has one ventral and two latero-dorsal lobes, which are continuous with the thoracic membranes. The latter form a medio-ventral "apron" across the thorax.

The opercular funnel is very elongated and has a deep hollow; it measures 2.6–3 mm in length, and is about as long as the peduncle. There are 37–47 marginal radii with blunt distal tips (Fig. 2, a, b).

The thorax has 7 segments, 6 of which are uncinigerous. The collar setae are of two types: slender, limbate capillaries (Fig. 2, c) and bayonet-shaped setae with 5 blunt teeth at the base of the blade (Fig. 2, d, e). The remaining thoracic setae are limbate capillaries (Fig. 2, f). The thoracic uncini have 6 teeth, of which the mostanterior one is the largest (Fig. 2, g); the abdominal uncini are smaller, with 5 teeth (Fig. 2, h). The abdominal setae are trumpet-shaped distally, with about 30 minute teeth in lateral view (Fig. 2, i).

The tube is white, thick and irregularly coiled, with a rounded projection over the mouth; there are 5 longitudinal ridges. It is about 4 mm in diameter near the mouth.

The species is new to the Japanese fauna.

DISTRIBUTION. Sri Lanka; Queensland, Australia; southern Japan.

Serpula vermicularis LINNAEUS, 1767

Serpula vermicularis: STRAUGHAN, 1967a, p. 206, fig. 3(a); DAY, 1967, pp. 809–810, fig. 38. 5. a-h; IMAJIMA, 1976a, p. 141.

MATERIAL EXAMINED. Dredge sta. 9 (2).

DISTRIBUTION. Cosmopolitan (?).

Genus **Crucigera** BENEDICT, 1887

Crucigera tricornis GRAVIER, 1906

(Fig. 3)

Serpula (*Crucigera*) *Websteri* var. *tricornis* GRAVIER, 1906, pp. 111–112; 1908, pp. 117–119, fig. 473–475, pl. 8, fig. 289.

MATERIAL EXAMINED. Sakaiura, underside of corals on reef (3).

DESCRIPTION. A large specimen is about 11 mm in length, including operculum, and about 1.2 mm in width in the thorax; it has 75 segments.

The branchiae have 18 gill-radioles on either side, which end in slender, pinnule-free filaments. The opercular peduncle is cylindrical and is inserted to the left. The operculum consists of a distal funnel, and three large proximal processes (Fig. 3, a). The opercular funnel has radial grooves on inner and outer side, some of them extending farther down to the center (base of funnel respectively) than others; these radial elements end distally in 50 to 64 marginal crenulations with pointed tips, and may bear one to four conical tubercles on

their inner side (Fig. 3, b). The three subequal proximal processes are digitiform, and project obliquely forwards.

The thorax has 7 segments, 6 of which are uncinigerous. The collar setae are of two types: bayonet-shaped setae with 2 large teeth at the base of the blade (Fig. 3, c) and simple capillaries with a minutely serrated margin (Fig. 3, d). The remaining thoracic setae are limbate capillaries (Fig. 3, e); the thoracic uncini are subtriangular, with 5 teeth in one row (Fig. 3, f). The abdominal uncini are similar to those of the thorax, but smaller, also with 5 teeth (Fig. 3, g). The abdominal setae are trumpet-shaped distally, with about 20 minute marginal teeth in lateral view (Fig. 3, h).

The tube is white, thin, and 1.4 mm in diameter near the mouth; it is sub-cylindrical in cross-section; it has 7 irregularly sinuous longitudinal ridges, with a row of minute pits between the ridges (Fig. 3, i).

REMARKS. *Crucigera tricornis* resembles *C. websteri* BENEDICT, 1887, from the Neotropical region in its long, digitiform processes; however, the latter species has four of them,

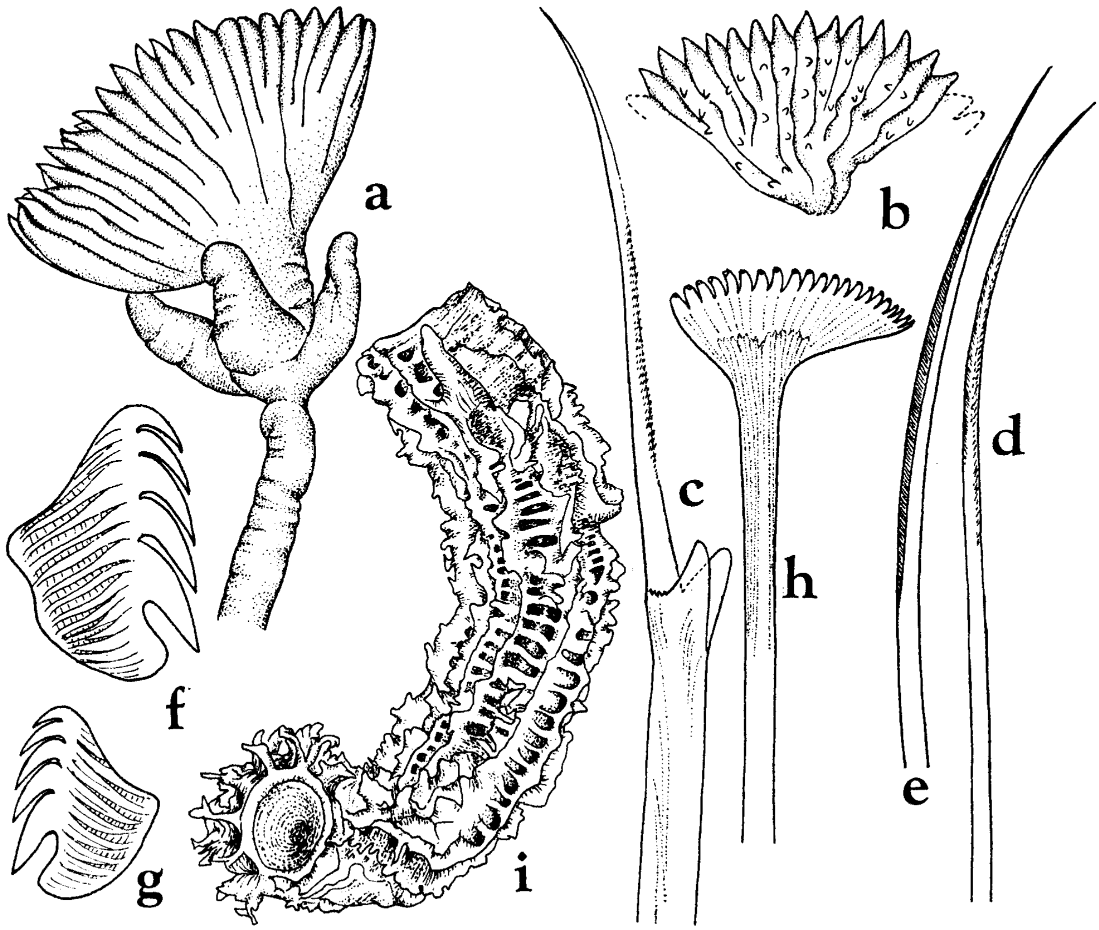


Fig. 3. *Crucigera tricornis* GRAVIER. a, Operculum with opercular stalk, in dorsal view, ×35; b, Part of operculum, in frontal view, ×35; c, d, Collar setae, ×265; e, Thoracic seta, ×265; f, Thoracic uncinus, ×900; g, Abdominal uncinus, ×900; h, Abdominal seta, ×1300; i, Tube, ×11.

and slightly less radial components (30–50 against 50–64). Moreover, the tube of *C. websteri* has only three to five longitudinal ridges.

The remaining species of *Crucigera, C. inconstans* STRAUGHAN, 1967a from Australia, and the group of *C. hespera* CHAMBERLIN, 1919, *C. irregularis* BUSH, 1904, *C. zygophora* (JOHNSON) 1901 from the North Pacific, have shorter processes, fewer radial components (up to 45 only) and a more simple tube.

DISTRIBUTION. Southern Japan; Red Sea; Madagascar.

Genus **Hydroides** GUNNERUS, 1768

Hydroides fusca IMAJIMA, 1976

Hydroides fusca IMAJIMA, 1976a, pp. 130–131, fig. 6, a-i; 1976b, p. 231.

MATERIAL EXAMINED. Dredge sta. 7 (13), sta. 11 (1), underside of corals on reef.

DIAGNOSIS. The largest specimen measures 12.5 mm in length; it consists of 61 segments including the thoracic ones. The opercular crown has 5–7 black horny spines with an incurved basal radial prong.

DISTRIBUTION. Southern Japan (Tsushima Strait, Kagoshima Bay, off Tanegashima; 60–115 m).

Hydroides exaltata (MARENZELLER, 1884)

Eupomatus exaltatus MARENZELLER, 1884, p. 217, pl. 4, fig. 3; IMAJIMA & HARTMAN, 1964, p. 368.
Hydroides exaltata: FAUVEL, 1953, p. 461; DEW, 1959, pp. 27–28, fig. 6, A; PILLAI, 1960, pp. 10–12, text-fig. 4, A-E; IMAJIMA, 1976a, pp. 127–128, fig. 4, a-j; 1976b, pp. 232–233.

MATERIAL EXAMINED. Minami-fukurozawa (2), Miyanohama (1), Sakaiura (3), underside of corals on reef.

DIAGNOSIS. The opercular crown has 8 spines, including a large dorsal one. The small spines are directed outwards; the dorsal spine is much larger, sickle-shaped, with a curved terminal hook. All spines have a small basal radial spine.

DISTRIBUTION. Japan (Enoshima; off Kumano, Mie Pref.; Mukaishima, Hiroshima Pref.; Amakusa, Kyushu; Tanega-shima; Koniya, Amami-Oshima); Solomon Islands; Sumatra; W. and E. Australia; Sri Lanka and S. India; Arabian Gulf; Red Sea.

Hydroides elegans (HASWELL, 1883)

Eupomatus elegans HASWELL, 1883, p. 633, pl. 12, fig. 1.
Hydroides elegans: ZIBROWIUS, 1971b, pp. 721–727, figs. 56–64; 1973a, pp. 42–44; 1973b, pp. 684–685; TEN HOVE, 1974, p. 46, figs. 1–3; IMAJIMA, 1976b, pp. 237–238, fig. 3, a-n.

MATERIAL EXAMINED. The bottom of Futami Harbour, Chichi-jima, attached to buoy (6).

Hydroides elegans is a typical harbour fouling species and has been introduced on ship's bottoms.

DISTRIBUTION. Australia; W. Europe and Mediterranean Sea; Sri Lanka; Hawaiian Islands; Philippines; Caribbean Sea; Japan (Pacific coast of southern and central regions).

Hydroides longispinosa IMAJIMA, 1976

Hydroides longispinosa IMAJIMA, 1976b, pp. 240–246, fig. 5, a-q.

MATERIAL EXAMINED. Futami Harbour, Chichi-jima, attached to buoy (25); Sakaiura, underside of corals on reef (5).

The species has been recorded previously from Miyanohama, Chichi-jima, based upon material obtained by the author in July 1969.

DISTRIBUTION. Southern Japan (Koniya, Amami-Oshima; Chichi-jima, Ogasawara).

Genus **Vermiliopsis** SAINT-JOSEPH, 1894

Vermiliopsis infundibulum/glandigera-group

(Fig. 4, a)

Vermiliopsis infundibulum: STRAUGHAN, 1967b, p. 35; 1967a, pp. 233–234; ZIBROWIUS, 1968a, pp. 121–124, pl. 2, figs. 30–33; pl. 3, figs. 1–15; pl. 14, fig. b.
Vermiliopsis infundibulum/glandigera-group: TEN HOVE, 1975, pp. 55–59; IMAJIMA, 1976a, pp. 139–141, fig. 11, a-o.

MATERIAL EXAMINED. Minami-fukurozawa (15), Miyanohama (20), Sakaiura (3), Nishi-jima (3), Tsurihama (5) underside of corals on reef; dredge sta. 7 (8), sta. 10 (3), sta. 11 (4); sta. 15 (5), sta. 16 (4).

DIAGNOSIS. The operculum consists of a proximal soft, globular part and a distal, chitinized terminal cap. The latter is variable in shape. In individuals collected from the shore reef it generally is elongated conical, cylindrical with a horn distally, or a high dome with 3 to 13 internal rings. However, opercula of individuals collected by dredging almost all have a low, terminal cap (Fig. 4, a).

DISTRIBUTION. Circum (sub-)tropical.

Vermiliopsis labiata (COSTA, 1861)

(Fig. 4, b-o)

Serpula labiata COSTA, 1861, p. 32, pl. 7, fig. 2.
Vermiliopsis richardi FAUVEL, 1909, pp. 62–65, fig. 7; ZIBROWIUS, 1968, pp. 125–127, pl. 3, fig. 16–24; 1969, pp. 128–129.
Vermiliopsis richardi var. *fauveli* MONRO, 1930, p. 212, fig. 89, a-d.
Vermiliopsis labiata: ZIBROWIUS, 1972, pp. 117–118; 1973a, pp. 45–46; TEN HOVE, 1975, pp. 55–57.

MATERIAL EXAMINED. Dredge sta. 2 (1), sta. 9 (1).

DESCRIPTION. The largest specimen measures 14 mm in length, including branchiae, and 1.2 mm in width in the thorax; it consists of 61 segments.

The gill-radioles of the branchiae are arranged in semicircles: 13 gill-radioles on the left side and 12 on the right. They are not connected by a branchial membrane and have elliptical tips; small distinct pyriform structures in the axes of the filaments have not been observed.

The opercular peduncle is slightly compressed dorso-ventrally, and is regularly annulated. It is inserted to the right at the base of the branchial crown, covering the first three normal filaments. The operculum has a fleshy bulbous part and a white calcareous terminal part; both parts are separated by a transverse, dark brown ring. The terminal part

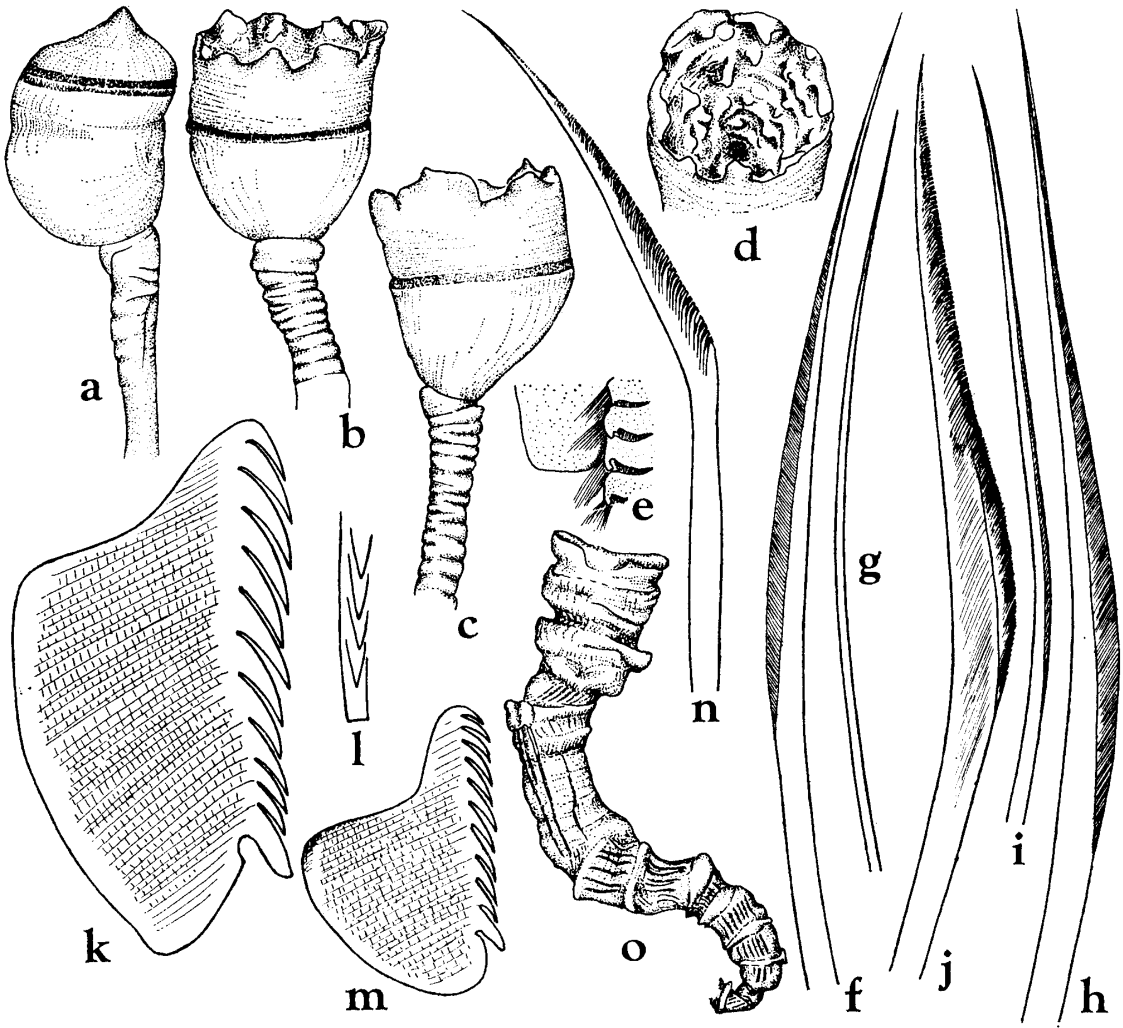


Fig. 4. *Vermiliopsis infundibulum/glandigera*-group. a, Operculum, in lateral view, ×12. *Vermiliopsis labiata* COSTA. b, Operculum, in dorsal view, ×16; c, The same, in lateral view, ×16; d, The same, in frontal view, showing inner surface, ×16; e, Part of thorax, showing end of thoracic membrane, ×16; f, g, Collar setae, ×280; h, i, j, Thoracic setae, ×320; k, Thoracic uncinus, ×700; l, Basal part of thoracic uncinus, in frontal view, ×700; m, Abdominal uncinus, ×700; n, Abdominal seta, ×480; o, Tube, ×5.

has eight dentations of irregular size (Fig. 4, b, c); its inner surface has eight ridges composed of a few small tubercles in one row (Fig. 4, d).

The collar has an entire margin; it consists of an unpaired medioventral lobe, and paired, well developed latero-dorsal lobes. The latter are continuous with the thoracic membranes, which end just posterior to the second row of uncini or setiger 3 (Fig. 4, e). There are no eyes on the dorsal surface of the thorax. The thorax has 7 segments, 6 of which are uncinigerous. The bundles of collar setae are very small, containing coarse limbate setae and slender capillary ones (Fig. 4, f, g). The following thoracic setae are similar to those of the collar; in addition, "sickle" setae or "*Apomatus*"-setae with a denticulate blade and a slightly limbate proximal zone are present from setiger 3 onwards (Fig. 4, h, i, j). The thoracic uncini have 12 teeth in one row (saw-shaped uncini) (Fig. 4,k); the mostanterior tooth is simple, truncated in frontal view (Fig. 4,l). The abdominal uncini are about half the size of the thoracic ones, with 10 to 11 teeth including the anterior one (Fig. 4,m). The abdominal setae are geniculate, with a coarsely denticulate edge (Fig. 4,n); they are replaced by long capillary setae in the posterior segments.

The tube is white; it is circular in cross-section and has 3 to 7 slender longitudinal ridges and some flaring peristomes encircling the tube (Fig. 4,o).

The species is new to the Japanese fauna.

DISTRIBUTION. Southern Japan; Mediterranean Sea; Gulf of Guinea.

Genus **Metavermilia** BUSH, 1904

Metavermilia acanthophora (AUGENER, 1914)

Vermiliopsis acanthophora AUGENER, 1914, pp. 155–158, pl. 1, figs. 21–24; DEW, 1959, p. 32, fig. 9, A-E; STRAUGHAN, 1967a, p. 234.
Metavermilia acanthophora: TEN HOVE, 1975, p. 57; IMAJIMA, 1976a, pp. 138–139, fig. 10, a-k.

MATERIAL EXAMINED. Dredge sta. 5 (1), sta. 9 (4).

The largest specimen from sta. 5 measures 43 mm in length, including the branchiae, and about 4.5 mm in width including thoracic setae, in the thorax; it consists of 127 segments. The operculum has 2 parallel tiers, with a long spine arising from the centre of the terminal tier.

DISTRIBUTION. Western and eastern Australia; southern Japan.

Metavermilia spicata sp. nov.

(Fig. 5)

MATERIAL EXAMINED. Dredge sta. 5 (5).

DESCRIPTION. The holotype is the largest specimen and measures about 19 mm in length and about 1 mm in width in the thorax; it consists of 125 segments.

The branchiae have on either side 13 gill-radioles, which have a pectiniform arrangement and are not connected by a branchial membrane; all gill-radioles end distally in fila-

ment-like tips. The second dorsal radiole on the right side is transformed into a large flat, ribbon-like opercular stalk, irregularly annulated, and wingless.

The operculum is sub-cylindrical (Fig. 5,a) to elongate conical (Fig. 5,b) resembling the shape of an ananas fruit or a horsetail, and is composed of four to ten parallel discs fringed by simple or bifurcated spines. Each disc is dark brown and covers the lower part of the next distal disc. The most distal disc consists of seven simple spines which are distally curved outwards (Fig. 5,c); they encircle a median, erect spine.

The collar has one ventral lobe and two latero-dorsal ones. The latter are continuous with the thoracic membranes, which end just posterior to the fifth uncinigerous segment. The thoracic membranes are narrow, and leave the dorsal thorax widely unprotected. The thorax has 7 segments, of which 6 are uncinigerous. The small fascicles of collar setae contain only a few limbate capillaries of two sizes (Fig. 5,d,e). The following thoracic

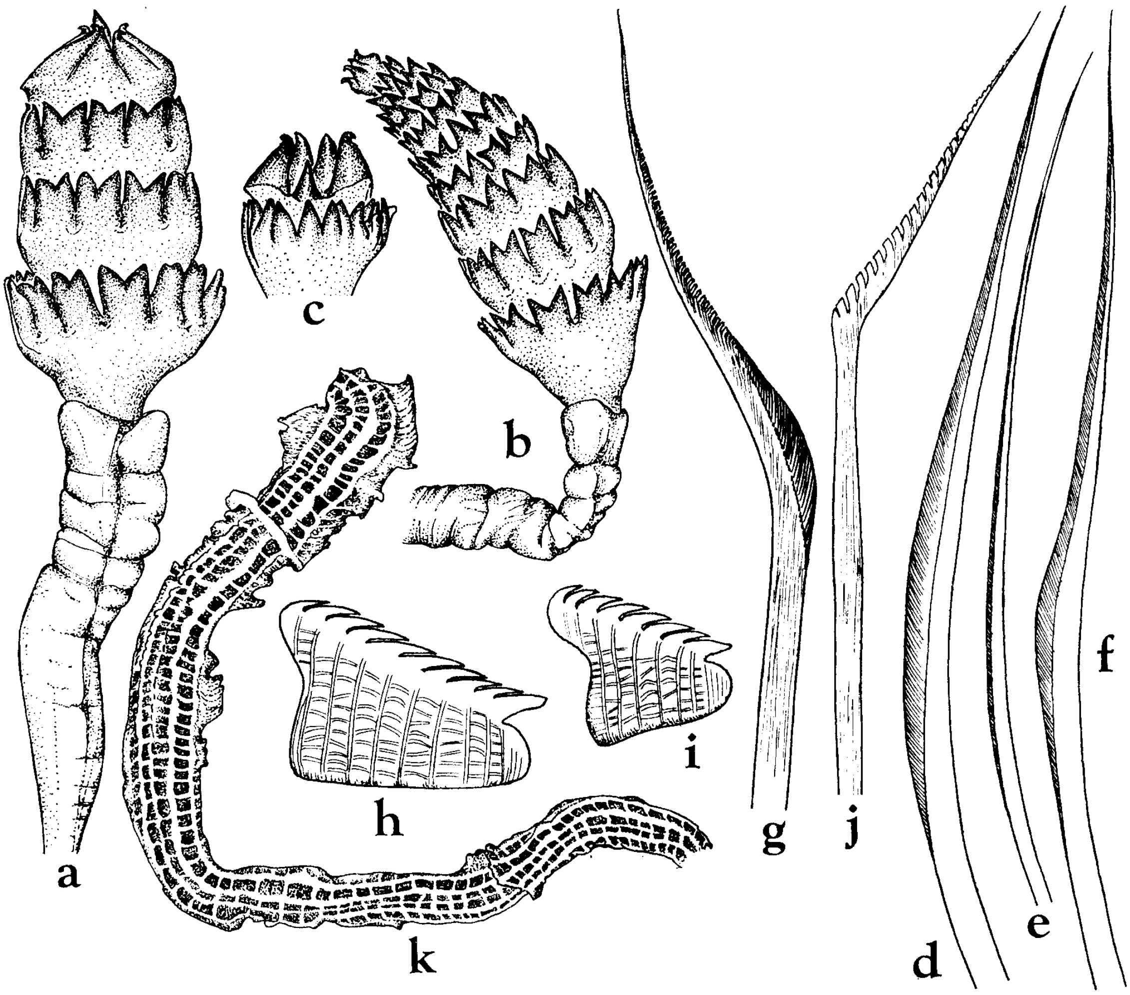


Fig. 5. *Metavermilia spicata* sp. nov. a, Operculum of holotype, ×30; b, Operculum of paratype, ×30; c, Superiormost disc of different operculum, half of the disc removed, showing a median spine, ×43; d, e, Collar setae, ×520; f, Thoracic limbate capillary seta, ×520; g, Thoracic "sickle" seta, ×520; h, Thoracic uncinus, ×1040; i, Abdominal uncinus , ×1040; j, Abdominal seta, ×1040; k, Tube, ×9.

bundles have limbate capillaries (Fig. 5,f) and "sickle" setae ("*Apomatus*-setae") with a denticulate blade and a short, limbate proximal zone (Fig. 5,g). The thoracic uncini are sub-rectangular and have a single row of 10 teeth, the anteriormost tooth is simple and larger than the remaining ones (Fig. 5,h). The abdominal uncini are sub-triangular and have 8 teeth including the anterior simple one (Fig. 5,i). The abdominal setae are geniculate, with a coarsely denticulate edge (Fig. 5,j); they are replaced by long capillary setae in the posterior segments.

The tube is white; it is semi-circular in cross-section, and has 5 slender longitudinal ridges and some flaring "peristomes" encircling the tube (Fig. 5,k).

REMARKS. *Metavermilia spicata* is characterized by its peculiar opercular structure, which is clearly distinct from that of the hitherto described species, viz.: *Metavermilia multicristata* (PHILIPPI), *M. acanthophora* (AUGENER), *M. annobonensis* ZIBROWIUS, *M. taenia* ZIBROWIUS, and *M. nates* ZIBROWIUS (1971a).

TYPE-SERIES. Holotype, NSMT-Pol. H 126; 4 paratypes, NSMT-Pol. P 127; 1 paratype collection TEN HOVE, ur. 266.

DISTRIBUTION. Southern Japan.

Metavermilia inflata sp. nov.

(Fig. 6)

MATERIAL EXAMINED. Miyanohama, underside of corals on reef (4).

DESCRIPTION. The holotype measures 10 mm in length, including the branchiae, and about 1 mm in width in the thorax; it consists of 74 segments.

The 10 to 13 pairs of gill-radioles have a pectiniform arrangement; they are not connected by a branchial membrane, and have filament-like distal tips.

The opercular peduncle is inserted just below and between the first and second normal filament on the right side of the branchiae; it is flat and ribbonlike with regular annulations. The operculum is simply globular, with a homogeneous semitransparent membrane all round; there is no calcareous deposit at the terminal end (Fig. 6,a,b). The collar is large and trilobed. The paired, rounded, latero-dorsal lobes are continuous with the thoracic membranes and end just posterior to the sixth uncinigerous segment; the unpaired ventral lobe is a triangular flap.

The thorax has 7 segments, 6 of which are uncinigerous. The small fascicles of collar setae contain only a few limbate setae of two sizes (Fig. 6,c,d). The following thoracic setae are similar to those of the collar; in addition, "sickle" setae ("*Apomatus*-setae") with a denticulate blade and a slightly limbate proximal zone are present from setiger 3 onwards (Fig. 6,e,f). Thoracic uncini have 8 to 9 teeth in one row (saw-shaped uncini) (Fig. 6,g). Abdominal uncini are similar to the thoracic ones, with 8 teeth in one row; the mostanterior tooth is simple (Fig. 6,h). Abdominal setae are geniculate, and have a rather long and narrow triangular blade; they are replaced by long capillary setae in the 25 most posterior segments (Fig. 6,i).

The tube is white; it is circular in cross-section, with 5 to 7 longitudinal keels and some transverse ridges (Fig. 6,j).

REMARKS. *Metavermilia inflata* resembles *M. multicristata* (PHILIPPI, 1844) from the Mediterranean Sea and *M. taenia* ZIBROWIUS, 1971a from off Portugal (690 m), in having a globular operculum. However, *M. inflata* is characterized by a homogeneous, semitransparent operculum, while the other two species have a horny cap on the distal part of the operculum.

TYPE-SERIES. Holotype, NSMT-Pol. H 128; 3 paratypes, NSMT-Pol. P 129.

DISTRIBUTION. Southern Japan.

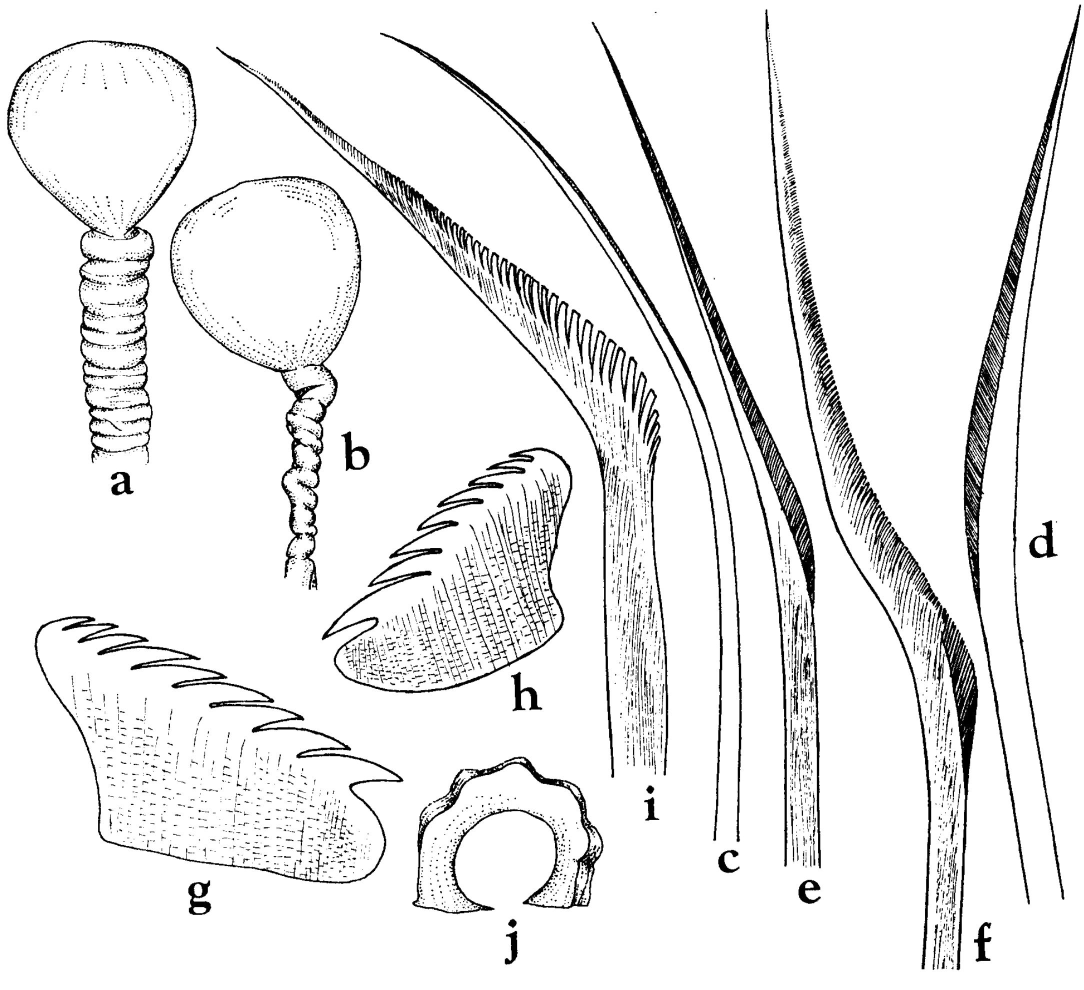


Fig. 6. *Metavermilia inflata* sp. nov. a, Operculum, in dorsal view, ×30; b, The same, in lateral view, ×30; c, d, Collar setae, ×420; e, f, Thoracic setae, ×420; g, Thoracic uncinus, ×1030; h, Abdominal uncinus, ×1030; i, Abdominal seta, ×1030; j, Tube, in cross-section, ×18.

Genus **Pomatoleios** PIXELL, 1913

Pomatoleios kraussii (BAIRD, 1865)

Pomatoleios kraussii: DAY, 1955, p. 449; 1967, pp. 800–801, fig. 38.3. a-f; IMAJIMA & HARTMAN, 1964, p. 372; STRAUGHAN, 1967a, p. 235; IMAJIMA, 1968, p. 34; 1976a, pp. 135–136.

Material Examined. Futami Bay, Miyanohama, Ani-jima, on reefs and rocks in sheltered areas in the intertidal region.

Distribution. Tropical Indo-Pacific.

Genus **Pomatostegus** Schmarda, 1861

Pomatostegus stellatus (Abildgaard, 1789)

(Fig. 7)

Terebella stellata Abildgaard, 1789, p. 142 (138–144), pl. 3, fig. 5a-b.

Pomatostegus stellatus: Pixell, 1913, p. 79; Fauvel, 1932, p. 246; 1953, p. 465, fig. 248; Okuda, 1937, pp. 309–311, figs. 56–58; Dew, 1959, pp. 41–42, fig. 14, A-G; Pillai, 1960, pp. 23–25, text-fig. 9, A-D; Straughan, 1967a, p. 238.

Pomatostegus actinoceros Mörch, 1863, p. 400, fig. 16–17; Willey, 1905, p. 314, pl. 8, figs. 3–4.

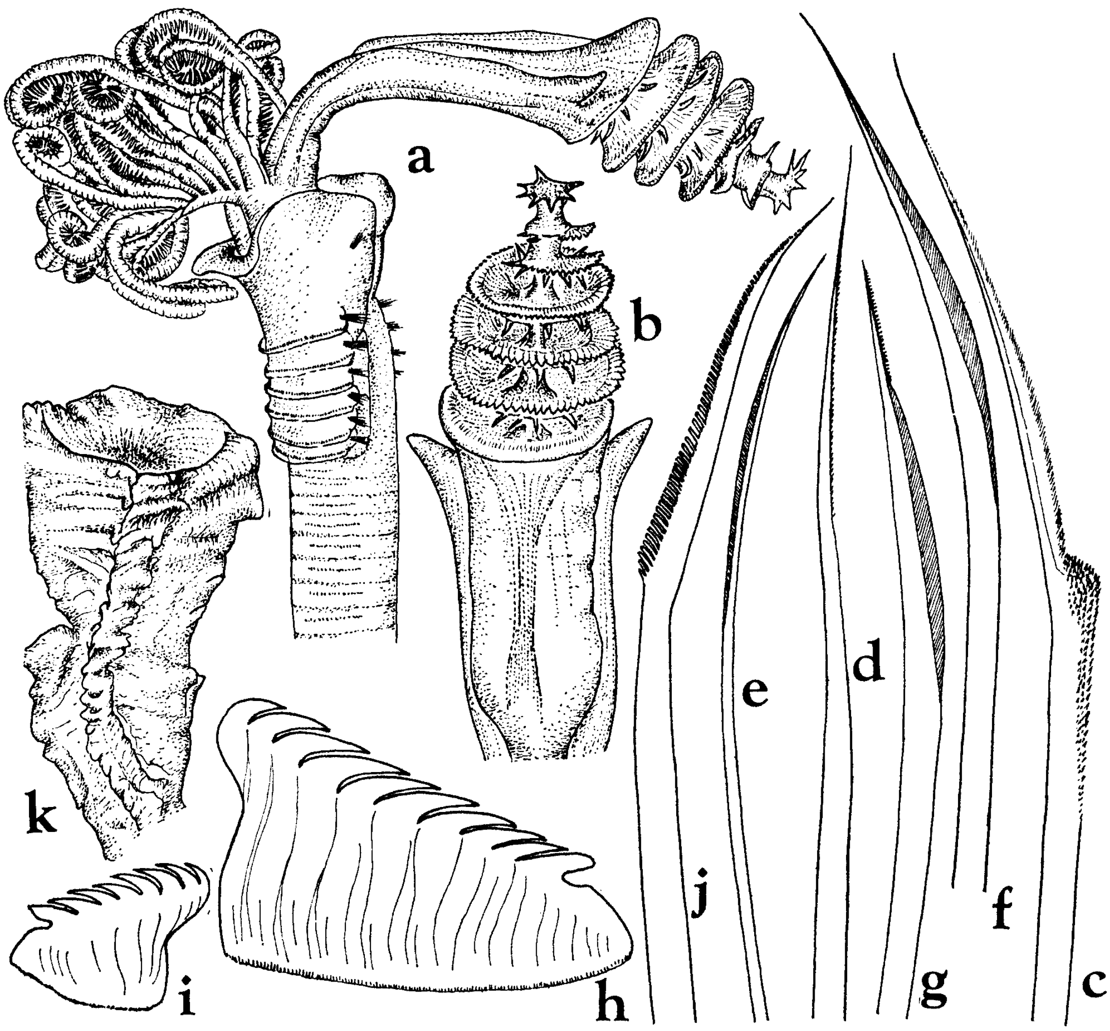


Fig. 7. *Pomatostegus stellatus* (Abildgaard). a, Anterior end, in lateral view, ×7; b, Operculum, in ventral view, ×10; c, d, Collar setae, ×265; e, f, Thoracic limbate capillary setae, ×265; g, Thoracic "sickle" seta, ×265; h, Thoracic uncinus, ×265; i, Abdominal uncinus, ×265; j, Abdominal geniculate seta, ×420; k, Tube, ×4.

MATERIAL EXAMINED. Sakaiura, on corals, 2 m (2).

DESCRIPTION. The largest complete specimen measures about 22 mm in length, and 3 mm in width in the thorax; it consists of 77 segments.

The branchiae have 20 gill-radioles on either side, which are arranged in two circles and are basally connected by a thin webbed membrane; the gill-radioles are marked by 4 to 5 dark green transverse bands. They terminate in a naked filament. The flattened opercular peduncle arises from the left side; it has a pair of broad, lateral wings, which nearly form a continuous fin along the entire length of the peduncle (Fig. 7,a).

The operculum is covered by a horny cuticle and bears a long narrow columella, which arises eccentrically near the dorsal side. The operculum has five horny, serrated discs piled up very close together; there is a star-like circle of spines projecting beneath each disc and a circlet of terminal spines (Fig. 7,b). The collar is well developed, with an entire, smooth margin; it is continuous with the thoracic membranes, which end just posterior to the second row of uncini.

The thorax has 7 segments, 6 of which are uncinigerous. The collar setae are of two types: bayonet-shaped setae with a denticulate proximal zone, and a distal part, fringed with many fine hair-like processes (Fig. 7,c), and finely serrated limbate capillaries (Fig. 7,d). The bundles of remaining thoracic setae contain three types of setae: two sizes of limbate capillaries (Fig. 7,e,f), and "sickle" setae with a denticulate blade and a limbate proximal zone (Fig. 7,g). The thoracic uncini have 10 to 12 teeth above the basal knob (Fig. 7,h). The abdominal uncini are similar to those of the thorax, but smaller, with 8 teeth (Fig. 7,i). Abdominal setae are all geniculate and have a rather long and narrow triangular blade (Fig. 7,j).

The tube is massive, roughly triangular in cross-section, with 4 low longitudinal ridges (Fig. 7,k).

The species is new to the Japanese fauna.

DISTRIBUTION. Circum-tropical.

Genus **Spirobranchus** BLAINVILLE, 1818

Spirobranchus cf. **polytrema** (Philippi, 1844)

(Figs. 8, 9)

Vermilia polytrema PHILIPPI, 1844, p. 194, pl. 6, fig. N.
Temporaria polytrema: STRAUGHAN, 1967a, p. 239; PILLAI, 1971, pp. 94–96, fig. 3, A-D.
Temporaria oligotrema STRAUGHAN, 1967a, pp. 240–241, fig. 13.
Spirobranchus polytrema: ZIBROWIUS, 1968a, pp. 157–160, pl. 7, fig. 10–24; 1968b, p. 380, pl. 1, fig. 10–12; 1973a, pp. 65–66.

Type A (Fig. 8)

MATERIAL EXAMINED. Tsurihama, underside of corals on reef (2).

DESCRIPTION. Of two specimens, a complete one measures 9.5 mm in length, and 0.7 mm in width in the thorax; it consists of 42 segments.

The branchiae have 5–8 gill-radioles on either side; the gill-radioles end distally in slender, pinnule-free filaments. The radioles are connected by a branchial membrane for about one-fourth of their length. The collar has one ventral lobe and two latero-dorsal ones. The latter are continuous with the thoracic membranes, which end posterior to the last row of uncini.

The peduncle arises from the base of the left branchial lobe; it is somewhat flattened and has a pair of wing-like expansions, bearing 4 only or 5–6 slender digitiform processes distally (Fig. 8, a,b).

The operculum consists of two distinct parts: a proximal soft, somewhat depressed

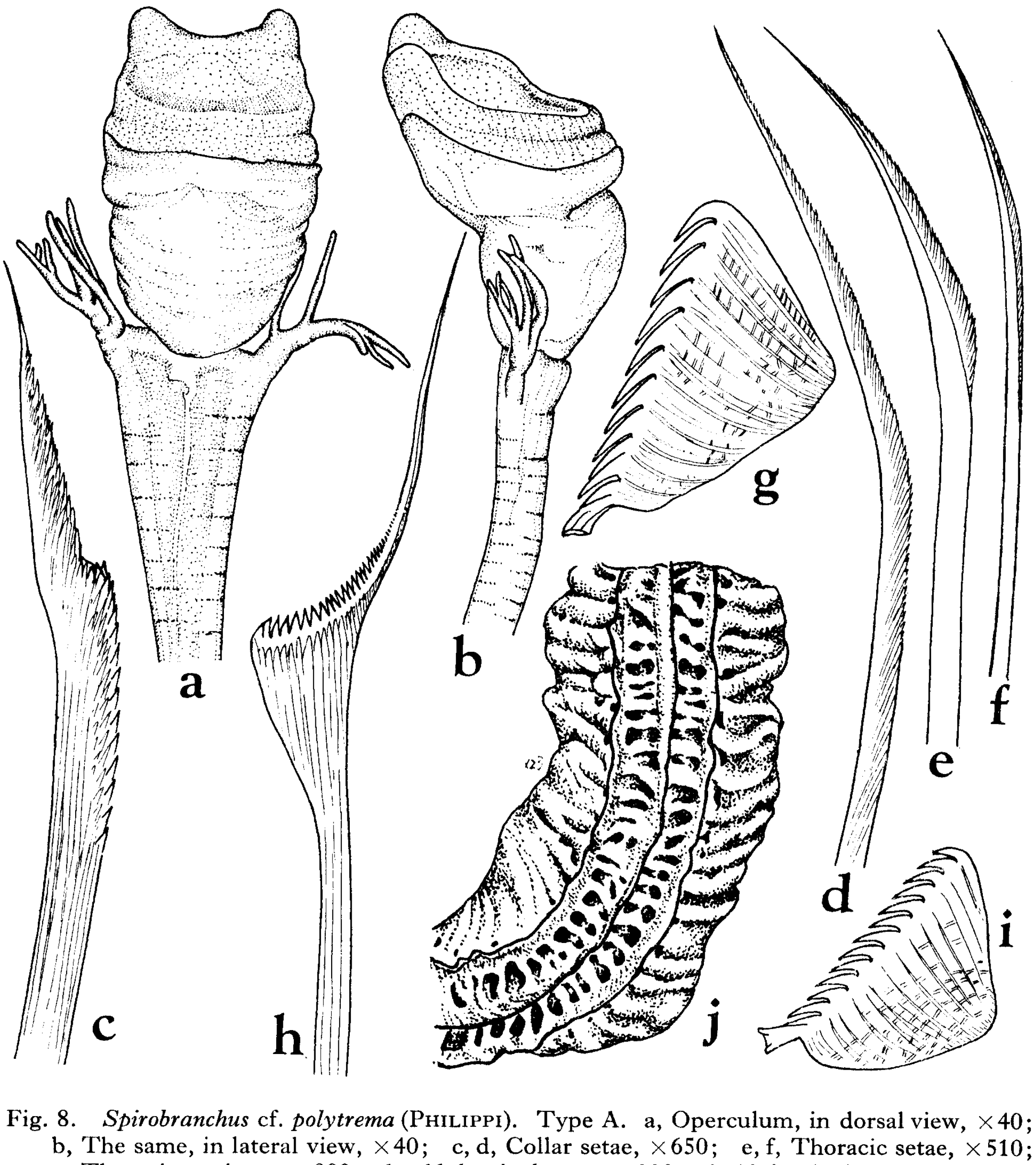


Fig. 8. *Spirobranchus* cf. *polytrema* (Philippi). Type A. a, Operculum, in dorsal view, ×40; b, The same, in lateral view, ×40; c, d, Collar setae, ×650; e, f, Thoracic setae, ×510; g, Thoracic uncinus, ×900; h, Abdominal seta, ×900; i, Abdominal uncinus, ×900; j, Median part of tube, lacking entrance, ×18.

globular part, and a slanting calcareous cap with rounded knobs (Fig. 8, a,b). Two opercula resemble in form closely.

The thorax has 7 segments, 6 of which are uncinigerous. The collar setae are of two types: bayonet-shaped setae covered with papillate to pilose processes along the distal portions of their shafts (Fig. 8,c), and capillary setae with minutely serrated blades (Fig. 8,d). The remaining thoracic setae are limbate capillaries of two sizes (Fig. 8, e,f); the thoracic uncini have 12 teeth, the mostanterior tooth is large and gouge-shaped (Fig. 8,g). The abdominal setae are compressed trumpet-shaped, terminating in a long delicate point, with a double row of serrations (Fig. 8,h); they number 2–3 in a segment and continue to the posterior end. The abdominal uncini are similar to those of the thorax (Fig. 8,i).

The tube is pale pink; it is subtriangular with a flattened area of attachment in cross-section. There are four longitudinal rows of circular pits on either side of three keels. The most lateral pits are very deep, forming a segmented channel in the lateral walls of the tube.

The specimens examined resemble specimens from Sri Lanka, reported upon by PILLAI (1971, pp. 94–96), closely.

Type B (Fig. 9)

MATERIAL EXAMINED. Sakaiura (13), Nishi-jima (8), Minami-fukurozawa (7), underside of corals on reef.

DESCRIPTION. Of the examined specimens a largest one is about 12 mm in length, including branchiae, and about 0.8 mm in width in the thorax; it consists of 61 segments.

The branchiae have 10–13 gill-radioles on either side, which are connected by a branchial membrane for about one-third of their length (Fig. 9,a). The radioles end in slender, pinnule-free filaments, and have numerous pinnae arranged in two rows along the axis. The collar has one ventral lobe and two latero-dorsal ones. The latter are continuous with the thoracic membranes, which end posterior to the last row of uncini.

The peduncle is inserted at the left or right side and is somewhat flattened, with a pair of lateral wings; the wings end distally in a simple finger-like process (Fig. 9,b–e), except for three specimens, where the distal end is bifurcated (Fig. 9,f).

The operculum consists of two distinct parts: a proximal soft, somewhat depressed globular part, and a distal calcareous part, with two rounded knobs dorsally and a ventral margin expanded in a rim (Fig. 9,b,c). The calcareous part is variable in form, from short to long, and it may show growth markings (Fig. 9,d–f).

The collar consists of one ventral and two latero-dorsal lobes that appears to be triangular. The thoracic membranes are continuous with the collar, and end posterior to the last row of uncini. The thorax has 7 segments, 6 of which are uncinigerous. The collar setae are of two types: fine limbate capillaries (Fig. 9,g) and bayonet-shaped setae with a median indention, separating the denticulate proximal zone from the finely serrated distal zone (Fig. 9,h). The remaining thoracic setae are limbate capillaries (Fig. 9,i,j). The thoracic uncini are rectangular, with 10 to 11 teeth; the mostanterior one is large and gouge-shaped

(Fig. 9,k). Abdominal setae are all compressed trumpet-shaped, terminating in a long fine point, with serrations arranged in a double row (Fig. 9,l). Abdominal uncini are sub-triangular, smaller than the thoracic ones, and have 9 to 10 teeth, with one anterior gouge (Fig. 9, m).

The tube is pink and has a prominent median tooth, projecting over the entrance; it has a low to high crest and a double row of pits near the entrance of the tube (Fig. 9,n,o).

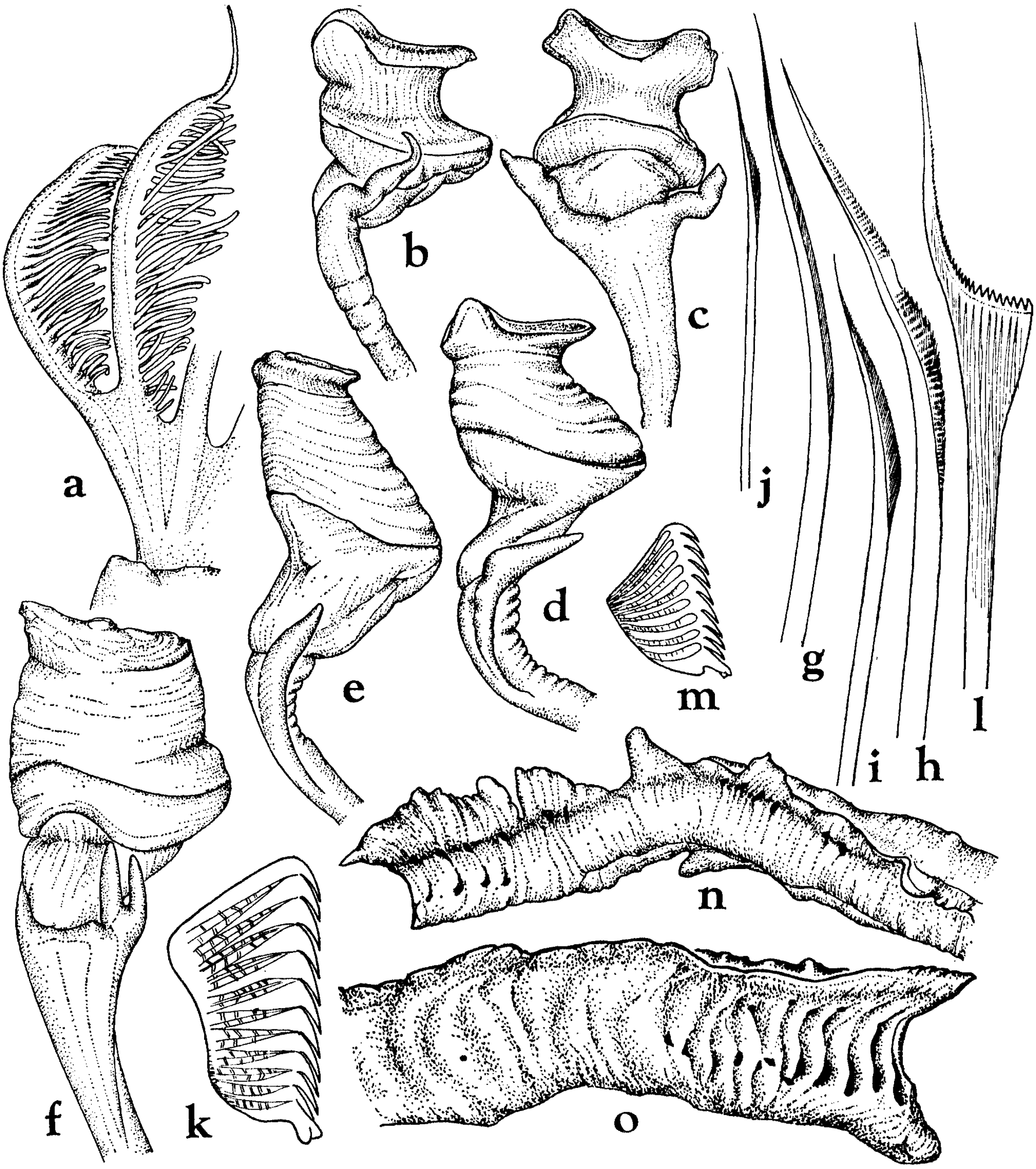


Fig. 9. *Spirobranchus* cf. *polytrema* (PHILIPPI). Type B. a, Part of branchiae, ×30; b-e, Opercula, in dorsal or lateral view, ×35; f, Operculum, with bifurcate peduncular wing, in lateral view, ×35; g, h, Collar setae, ×420; i, j, Thoracic setae, ×420; k, Thoracic uncinus, ×750; l, Abdominal seta, ×750; m, Abdominal uncinus, ×750; n, o, Tubes, n, ×6, o, ×16.

The species is new to the Japanese fauna.

REMARKS. It is unlikely that the species described above will prove to be the same as the Mediterranean species. However, regarding the complexity of the group involved, the confusion of names by previous authors, and the scarcity of data on infraspecific variation of the individual species, it appears best not to introduce another name, and to await a full-scale revision of the group.

DISTRIBUTION. Confused, similar forms have been reported from Mediterranean Sea; Indo-West Pacific; Sri Lanka; Australia; Japan.

Spirobranchus latiscapus (MARENZELLER, 1884)

Pomatostegus latiscapus MARENZELLER, 1884, pp. 218–219, pl. 4, fig. 5.
Spirobranchus latiscapus: FAUVEL, 1936, p. 89; IMAJIMA & HARTMAN, 1964, pp. 373–374; MORTON & MILLER, 1968, p. 126; BAILEY-BROCK, 1972, pp. 405–408; 1976, p. 73; IMAJIMA, 1976a, pp. 137–138.

MATERIAL EXAMINED. Dredge sta. 9 (5).

DISTRIBUTION. Japan; Sulu Sea; New Zealand; Hawaiian Islands.

Spirobranchus giganteus corniculatus (GRUBE, 1862)

Spirobranchus giganteus corniculatus: TEN HOVE, 1970, pp. 24–32, figs. 63–73, pl. 2, c; IMAJIMA, 1976a, pp. 136–317, fig. 9, a-p.

MATERIAL EXAMINED. Miyanohama, Minami-fukurozawa, Sakaiura, Ani-jima, Nishi-jima, in aggregated masses on reef or rocks.

DISTRIBUTION. Indian Ocean; Malaysian Archipel.; Philippines; southern Pacific Islands; N. Eastern Australia; Japan.

Genus **Protula** RISSO, 1826

Protula tubularia caeca subsp. nov.

(Fig. 10)

MATERIAL EXAMINED. Miyanohama (4), Tsurihama (3), Minami-fukurozawa (9), Sakaiura (1), Ototo-jima (1), underside of corals on reef.

DESCRIPTION. The holotype measures 25 mm in length, including the branchiae of 5 mm, and 1.2 mm in width in the thorax; it consists of 89 segments.

The gill-radioles arise from paired lobes, in a pectiniform arrangement; they number 17 on the left and 16 on the right side. The paratypes have 15 to 19 gill-radioles on either side. They are connected by a branchial membrane for about one-fifth of their length; all end distally in slender filiform tips. Eyespots have not observed. There is no operculum. The collar is large and consists of an unpaired medio-ventral triangular flap and paired rounded latero-dorsal lobes. The latter are continuous with the well-developed thoracic membranes, which overlap each other at the medial line of the thorax, and end just posterior

to the sixth uncinigerous segment; their posterior margins are marked by an orange-coloured glandular band in the preserved specimens.

The thorax has 7 segments, 5 (not 6) of which are uncinigerous. The bundles of collar setae are of equal size as the following bundles and contain limbate setae of two sizes (Fig. 10,a,b). The following dorsal bundles have limbate setae (Fig. 10,c), "*Apomatus*-setae" appear from setiger 4 onwards (Fig. 10,d). The thoracic uncinigerous tori are present from the third setigerous segment onwards; the uncini have a single row of 22 to 23 teeth and a long basal process, with a truncated anterior end (Fig. 10,e,f). The abdominal uncini are about two-thirds the size of the thoracic ones, with 20 to 22 teeth in two to three rows (Fig. 10,g). The abdominal setae are all geniculate, more or less sickle-shaped, with a coarsely denticulate edge (Fig. 10,h).

The tube is white, thick and irregularly coiled; it is circular in cross-section and has 2 slender longitudinal ridges (Fig. 10,i,j)

REMARKS. *Protula tubularia caeca* can be distinguished from the typical subspecies, *P. tubularia tubularia* (MONTAGU, 1803) from England, by the absence of red eyespots on the gill-radioles, moreover, the uncini of *P. tubularia caeca* have a long basal process with a

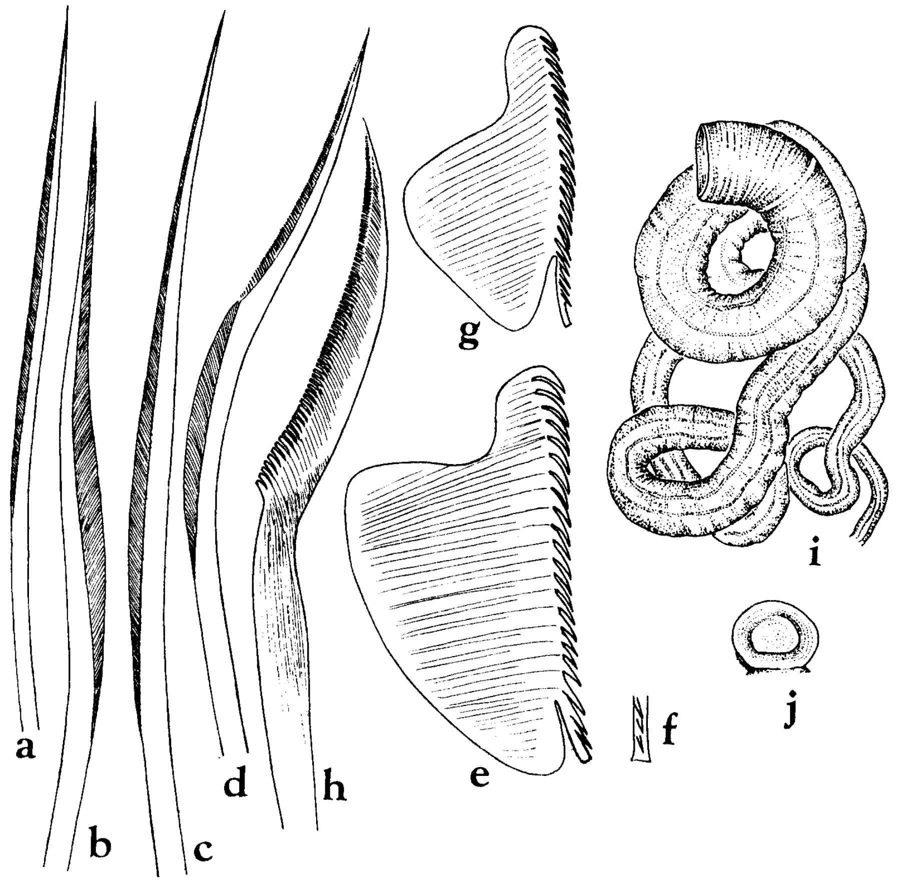


Fig. 10. *Protula tubularia caeca* subsp. nov. a, b, Collar setae, ×300; c, Thoracic seta, ×260; d, "*Apomatus*-seta", ×300; e, Thoracic uncinus, ×890; f, Part of basal process of thoracic uncinus, ×890; g, Abdominal seta, ×890; h, Abdominal seta, ×450; i, Tube, ×4; j, Mouth of tube, in frontal view, ×4.

truncated tip distally, instead of bifid one.

Type-series. Holotype, NSMT-Pol. H 130; 17 paratypes, NSMT-Pol. P 131.

Distribution. Southern Japan.

Zoogeography

The Ogasawara Islands are influenced by several warm return currents of the Kuroshio and North Equatorial currents. Accordingly, it is commonly stated that the fauna in this area is closely related to that of the Ryukyu Islands or the south-east coasts of Formosa, and partly to that of Micronesia.

This is confirmed by the present study, of the 18 recorded species 7 have a wide Indo-Pacific distribution, another 5 species have a nearly world-wide or circum-tropical one. The distribution of *Spirobranchus polytrema* is not clear, but it is presumably Indo-Pacific too. The remaining 5 species have a distribution limited to Japan, as far as known yet.

要　　約

伊豆・マリアナ弧諸島の自然史科学的総合研究の一環として，小笠原諸島の父島・兄島・弟島・西島の各地で磯採集ならびにその周辺海域でドレッヂによる海産無脊椎動物相の調査を行なった．採集した多くの動物のうちから多毛環虫類のカンザシゴカイ科（Serpulidae）の種類が研究された．カンザシゴカイ類は石灰質の管を作って，石・貝殻または死んだイシサンゴ類などの上に固着して生活するものであって，幼生期の浮遊生活の時代に分布が拡がる．しかし，ある場所で船底に付着したものが，そのまま他の場所に運ばれ，丁度生殖時期であれば，その場所で幼生が定着するという人為的な分布も考えられる．

この地方で明らかにされた9属，18種には2新種，*Metavermilia spicata*, *Metavermilia inflata*, 1新亜種，*Protula tubularia caeca*，ならびに5日本新記録種，*Serpula watsoni*, *Crucigera tricornis*, *Vermiliopsis labiata*, *Pomatostegus stellatus*, *Spirobranchus* cf. *polytrema* が含まれる．また，*Crucigera*, *Pomatostegus* の2属は現在まで日本で報告されていなかった．

報告された18種類のうち，*Serpula watsoni*, *Crucigera tricornis*, *Hydroides exaltata*, *Metavermilia acanthophora*, *Pomatoleios kraussii*, *Spirobranchus latiscapus*, *Spirobranchus* cf. *polytrema*, *Spirobranchus giganteus corniculatus* の8種はインド・太平洋に広く分布している．また，*Serpula vermicularis*, *Hydroides elegans*, *Vermiliopsis infundibulum/glandigera*, *Vermiliopsis labiata*, *Pomatostegus stellatus* の5種は地中海，大西洋を含む広い海域に分布している．そして *Hydroides fusca*, *Hydroides longispinosa* と新たに記載された2新種，1新亜種の合計5種が現在のところ日本固有種であり，小笠原特産種は2新種と1新亜種になる．従って，小笠原諸島の海域におけるカンザシゴカイ科の⅔以上が，インド・太平洋，あるいは世界に広く分布していることになる．しかし，黒潮によって支配されている日本の沿岸で豊富に見出される *Hydroides albiceps* がいまだ発見されていないことは，黒潮支流から南下するいくつかの反流による種類の分散の程度があまり強いものでないと推察される．一方，ミクロネシアに端を発する北赤道海流の分流がマリアナ諸島を経由して北上し，その一部が小笠原諸島付近に達するが，ミクロネシアやマリアナ諸島海域の多毛類相が未調査なためにこれらの海域と比較検討することができない．

東京湾，大阪湾，広島湾，長崎湾やその他の大きな湾でかなり有機物が多く含まれ，水質が汚濁されている湾奥に生息している *Hydroides elegans* が，二見湾の清瀬付近で見出されたのは非常に意外であった．これは，東京―小笠原間の船底について運ばれたものが定着したと考えられる．そして，清瀬付近はすでにこの種類が生息できるような海水になっていることであり，将来の二見湾の自然保護のために適切

な処置の検討が講じられなければならない.

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